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### (54) Improvements in and relating to bicycle drive assemblies

(57) A bottom bracket bearing assembly for cycles comprising a plane bracket axle 1 into which the inner rings of bearings 4 (4', Fig.2) employing steel rollers or balls 3 (3', Fig.2) may be pressed, the outer tracks of the bearings being provided within bracket cups 2 (2', Fig.2) with outer diameters adapted to be secured in the end

of the bracket shell 5. The bearings are held in place between the two pedal cranks 8, 9 with a washer 6, a spring washer, an expanding distance piece (12, 13, Fig.4), or any suitable combination of these.

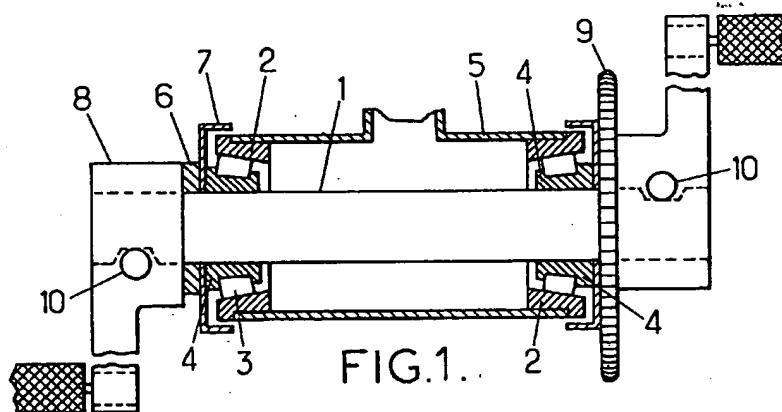


FIG.1.

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**Description**

The present invention relates to pedal-operated cycles and particularly to the bottom bracket bearing assemblies of the drive transmission mechanism thereof. Its purpose is to make available to cyclists a universal "Do it yourself" bicycle drive assembly for improved and more efficient working over long periods, which anybody, handy with a hammer, should be able to dismantle and refit in a very short time.

In the usual construction of bottom bracket bearing assemblies, a single series of steel balls is arranged at each end of the bracket axle and the latter turns in direct contact of the balls, the axle having collars forming tracks for the balls which are arranged one by one in a free state to run also on tracks provided by bracket cups that are threaded into the bottom bracket shell, the axle projecting at each end from the cups and the chain-wheel being fixed at one end and a crank carrying a pedal at each end. The threaded bracket cup is associated with a check nut or ring and is used for adjusting purposes. One of the bracket cups has right hand threads, the other is left handed. A fact that confuses even some veteran cyclists.

In a second version of the bottom bracket bearing assembly common in Russian and German bicycles, the tracks mentioned above are arranged in reverse order (2', 4' in Figure 2) and the inner ring 4' screw up on to the steel balls in the bracket cups by mean of threads on both sides of the axle, again, one side right handed, the other left. The brackets cups have no threads in this case, and are pressed into the bore of the bracket shell, one on each side.

According to the present invention the bearing assembly comprises a plain axle on which the inner rings of bearings - using steel balls or rollers - may be pressed, one at each end, the outer tracks being provided within bracket cups with outside diameters suited to be spigotted or screwed into the bottom bracket shell.

The bearings are held in place between the two cranks, the travel of the cotter pin within the groove in the axle being used to close in on the bearing for adjustment, if necessary, with the help of washers or spring washers as distance pieces.

A rotating or fixed dust cap may be provided at the end of each bracket cup. In some cases a plain washer could serve the purpose of preventing dust from the bearings.

This arrangement allows me to employ bearings with taper rollers which make a greater total contact area than balls and leads to a more efficient running over long periods of time and whether taper rollers or other rollers of cylindrical or barrel shape, or steel balls are used, greater overall diameters of the bearing are permissible.

The invention is herein described, by way of example only, with reference to the accompanying drawings, wherein :

- Figure 1 shows a bottom bracket bearing assembly fitted with taper roller bearings ;
- Figure 2 shows a bearing assembly using steel balls ;
- Figure 3 shows the fitting of bracket cups with plain spigots into threaded bracket shells using a bolt and two washers ;
- Figure 4 shows a bracket axle to which the pedal cranks are connected in a fixed joint.

Figure 1 illustrates a bottom bracket bearing assembly fitted with taper roller bearings, the adjusting of the bearings being done with the help of washer or distance piece 6. A standard 5/8", an inch symbolized by a double quote " being equal to 2.54 cm, spring washer may be used instead of distance piece 6, to make the bearing assembly into self adjusting.

Figure 2 illustrates a bearing assembly employing steel balls. The greater total contact area of the steel balls achievable in this type of assembly together with the mobility of the inner rings ensure a greater adaptability of the bearings under conditions of wear, and a smoother operation of the pedals over a long period of time.

The purpose of the two circlips 14 in Figure 2 is to hold the inner rings 4' in place prior to fitting the two cranks 8 and 9 (in Figure 1). The bracket axle 1 may be moved to the sides as necessary during the fitting process, since there are no grooves on the bracket axle for the circlips 14. Also here a self-adjusting bearing may be obtained by the use of a standard 5/8" spring washer. The bracket axle may also be provided with grooves for circlips 14 at one or both ends, for holding the bearings in place instead of the cranks.

Figure 3 illustrates a simple method of fitting bracket cups 2' with plain spigots into threaded bracket shells 5, by means of a 3/4" bolt 15 and two washers 16. In this case the spigots should be about 3/4 millimeter oversize, compared to the bore of the threaded portion of the bracket shell.

Figure 4 illustrates a bracket axle 1' to which the pedal cranks are connected in a fixed joint which cannot be used for adjusting purposes. Instead we have an expanding distance piece consisting of a bolt and nut unit, 13 and 12 in Figure 4, which may be used for adjusting the bearings. Even here a 5/8" spring washer may be used at one or at both ends of the axle 1', to obtain a self-adjusting bearing. In this case the threaded portion 17 of the axle should facilitate the pressing into place of the spring washer or washers, between the pedal crank and the inner ring.

The bracket cups 2, 2' in Figures 1 and 2 are made with a plain spigot. They may also be made screw threaded. The steel balls and rollers may be caged.

Referring to Figure 1 the bracket axle is fitted at each end with a taper roller bearing. The bracket cups 2 with inner surfaces tapered to form the outer tracks of the rollers 3, are pressed one at each end of the bracket shell 5. An inner ring 4 together with caged taper rollers

3 is pressed into one end of the bracket axle 1, followed by the dust cap 7 and chain wheel 9 which is secured provisionally by means of cotter pin 10 to groove 11 on the axle.

The axle, in one piece with the chain wheel, is now inserted through the right end of the bracket shell 5, and the second inner ring 4 with caged rollers 3 is pressed into the bracket axle 1 at the opposite end and tapped gently in until the taper rollers 3 on both inner rings 4 are sitting firmly on their tracks within the two bracket cups 2. With the second dust cup 7 in place, the left crank should be pressing it on to the inner ring of the bearing when the second cotter pin is inserted pointing in the opposite direction to the first one. If it does not do so, it should be made to do so by inserting a suitable washer 6 between the crank and the dust cap 7.

In the process of finally securing the cotter pins, all slackness in the bearings should be taken up by gently tapping the cranks, one against the other. This adjustment is possible due to the fact that the groove 11 is wider than the cotter pin 10 allowing it, together with each crank, a travel of two to three millimeters from end to end of the groove. While driving the cotter pins in, or the two cranks towards each other, it is advisable to use two hammers, a heavier one as counter weight on the opposite crank or on the opposite side of the crank arm when a cotter pin is being driven in.

The bearing assembly in Figure 1 may also be fitted as shown in Figure 2 where the gap between the bracket cup 2' and the inner ring 4' is very small, there is no need for a dust cap. So all that is needed to complete the assembly in Figure 2 is to fit the two pedal cranks (8 and 9 in Figure 1) :

- a) By themselves ; If steel balls are caged, without circlips ;
- b) With the help of a washer or washers as distance pieces ;
- c) With the help of a spring washer on one or on both sides of bracket axle ;
- d) With the help of an expanding distance piece (12,13 in Figure 4) ;
- e) With any suitable combination of the above.

Most of these options exist also in bearing assemblies employing bracket axles 1' as in Figure 4. In such assemblies any play in the bearing could be eliminated without dismantling the pedal cranks ; by simply wedging an additional circlip 14 between the pedal crank and the inner ring.

The chain crank 9 may be made in one piece with bracket axles 1 and 1' (Figures 1 and 4). The same with pedal crank 8. A drive assembly according to this invention can employ larger steel balls in any given bore of bracket shell, be self-adjusting, and can be dismantled for inspection in less than 60 seconds.

While the invention has been described with respect to a limited number of embodiments, it will be appreciated that many variations, modifications and

other applications of the invention may be made.

### Claims

- 5. 1. A bottom bracket bearing assembly for cycles comprising a plane bracket axle into which the inner rings of bearings - employing steel balls or rollers, or taper rollers - are pressed, the outer tracks of the bearings being provided within bracket cups with outer diameters adapted to be secured in the end of the bracket shell, wherein said bearings are held between the two cranks with a washer, a spring washer, an expanding distance-piece or a combination thereof, said bearings being provided with a fixed or rotating dust cap or washer at the end of each bracket cup.
- 10. 2. A bearing assembly according to claim 1, comprising a bracket axle to which the pedal cranks are connected by means of a cotter pins.
- 15. 3. A bearing assembly according to claim 1, comprising a bracket axle to which the pedal cranks are connected by connecting means other than by means of cotter pins, said connecting means including straight and smooth surface portion of the axle.
- 20. 4. A bearing assembly according to any of the preceding claims, comprising a bracket axle made in one piece with the chain-wheel crank or with the left hand pedal crank.
- 25. 5. A bracket axle adapted to fit into a bottom bracket bearing assembly for cycles according to claim 4, said bracket axle being made in one piece with the chain-wheel crank or with the left hand pedal crank.
- 30. 6. A bracket axle adapted to fit into a bottom bracket bearing assembly for cycles as claimed in claim 3, said bracket axle having square shaped tapers at the two ends adapted to fit identically-shaped apertures in the pedal crank arms.
- 35. 7. A bracket axle according to one of preceding claims 5 or 6, said bracket axle being provided with grooves for circlips, for holding the bearings in place, at one or at both ends of said bracket axle.
- 40. 8. A bearing assembly according to any of preceding claims 1 to 4, in which said bearings are held in place between a pedal crank and a circlip.
- 45. 9. A bearing assembly according to any of preceding claims 1 to 4, in which said bearings are held in place between two circlips.
- 50. 10. A two or three-wheel cycle incorporating a bottom bracket assembly according to any of the preceding

claims.

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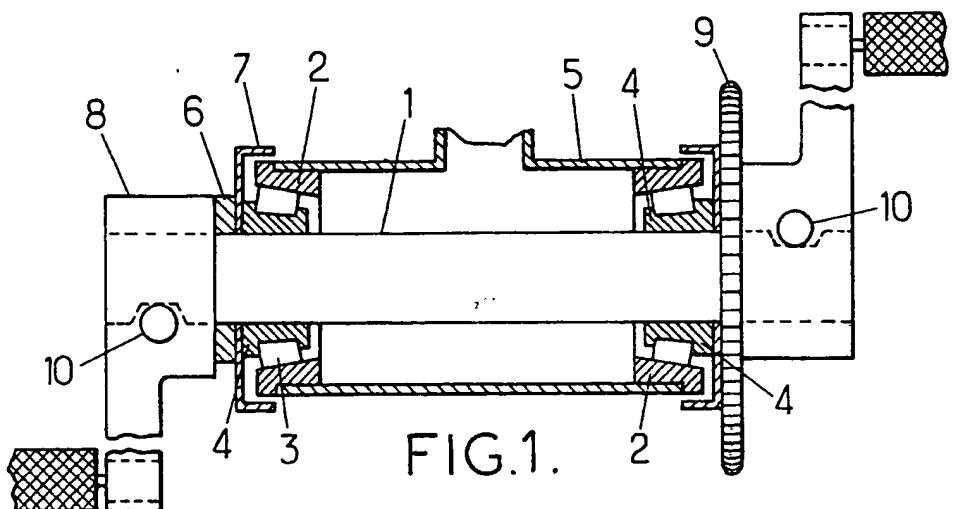


FIG. 1.

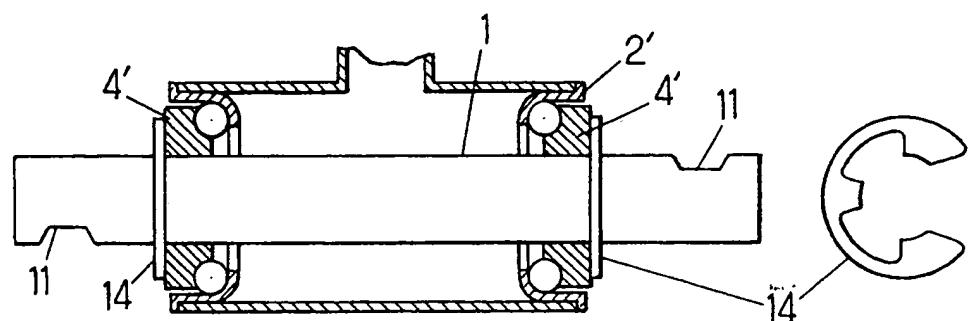


FIG. 2.

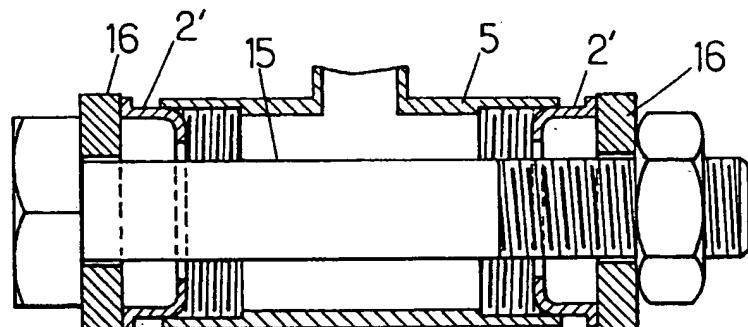


FIG. 3.

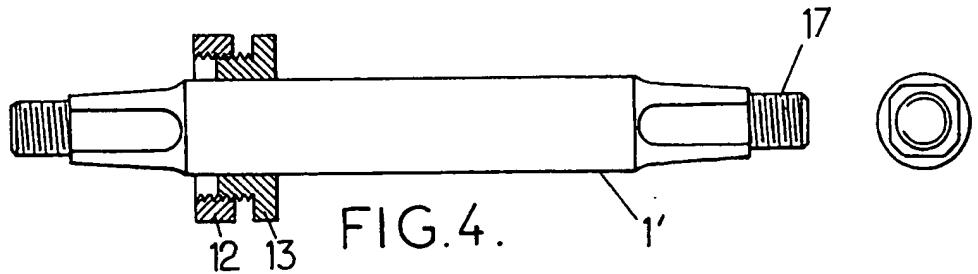


FIG. 4.



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## EUROPEAN SEARCH REPORT

Application Number  
EP 96 40 0472

DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
A	GB-A-928 598 (SOLOMON) * page 2, line 13 - line 64; figures *	1	B62M3/00
A	DE-C-133 358 (SCHNEIDER) * the whole document *	1	
A	FR-A-2 328 607 (MONARK-CRESCENT AB) * the whole document *	1	
E	GB-A-2 292 917 (SHALOM) * the whole document *	1-10	
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TECHNICAL FIELDS SEARCHED (Int.Cl.6)			
B62K B62M			
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The present search report has been drawn up for all claims			
Place of search	Date of completion of the search	Examiner	
THE HAGUE	8 August 1996	Grunfeld, M	
CATEGORY OF CITED DOCUMENTS		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ----- & : member of the same patent family, corresponding document	
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